ON SCENE

THE NATIONAL MARITIME SAR REVIEW

DEPARTMENT OF TRANSPORTATION
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FLIR MAKES ITS OPERATIONAL DEBUT

Last June 14th, a Los Angeles HH-52 performed a successful night SAR mission, in which an unlighted boat was located by Forward Looking Infra Red (FLIR) equipment. The sailboat was located in total darkness and the two people on board could be seen on the FLIR scope to be waving their arms!

Well after sunset on June 14, 1981, Mr. Bill Barton of Malibu Court called the Eleventh District Operations Center and reported that his son and a friend had been swept out to sea by strong northerly winds. They were in a nine foot Boston Whaler sailboat with no survival equipment or lighting on board. They had last been seen, about fifteen minutes earlier, trying to row towards shore from a position approximately 2.5 miles southwest of Malibu Point. A "Baywatch Malibu" (lifeguard) boat was already searching. Winds throughout the day had been Northeast at 15 to 30 knots.

Coast Guard HH-52 number 1428 proceeded from Air Station Los Angeles and commenced a Parallel Track (PS) search of a 3 by 6 mile area centered about the last known position of the boat. Well into the search, the SAR crewman noted that his FLIR scope was displaying both the boat and the two people on board, waving their arms. The target was lost for a short period of time, then relocated. The helicopter then dropped a 45 minute smoke flare, and vectored the Baywatch Malibu boat to the scene. The Baywatch Malibu towed the boat with its two 25 year old occupants to port, no worse for wear.

This is the first successful FLIR SAR mission to come to our attention. If any reader knows of an earlier case, please write to your editor.

ON SCENE is a SAR publication published by the Commandant, U. S. Coast Guard as a source of information concerning current and proposed procedures as well as new developments in SAR. Articles contained herein are non-record and non-directive.

BRIDGE JUMPERS

By CDR A. M. Steinman

Chief, Special Medical Operations Branch

Few people casually glancing through this issue of "On Scene" will be able to pass up an article entited "Bridge Jumpers," for most of us have a bit of the "National Enquirer" prurient curiosity buried somewhere inside us. So now that I've gotten your attention, I'm afraid I'll have to disappoint you by declaring that this article contains no gory details of great leaps, no juicy tidbits from suicide notes, and no sad stories of lives gone sour. Instead, this article is merely a brief description of how to rescue a bridge jumper when you arrive on scene. It is particularly directed at search and rescue boat crewmen from stations and bases situated near large bridges from which people like to jump (e.g. CGS Fort Point - Golden Gate Bridge, CGS Yerba Buena Island -Bay Bridge, CGS Cape Cod Canal - Bourne Bridge, and others).

It is a known fact of physics that the terminal velocity of a human being falling through air is about 100 mph. From a standing start a human being will reach that velocity in 4.6 seconds, or after falling for 336 feet. If the bridge in your area is only 200 feet high, a bridge jumper's impact .elocity will be 77 mph; from 100 feet, impact velocity is 55 mph. But mathematics aside, it's obvious that someone hitting the water at any of these speeds is going to be either killed outright, or very seriously injured. In fact, I know of few other situations you're apt to encounter in maritime SAR operations where there is likely to be more potential for major traumatic injury than in a bridge jumper.

Those of you who are EMTs or hospital corpsmen should already be aware of the types of injuries a major fall can create. But for the sake of review, and for those not yet trained as EMTs, here's a list of some of them:

1) open or closed head injuries yielding unconsciousness
2) near-drowning secondary to unconsiousness
3) spinal injuries (particularly cervical spine trauma)
4) fractured ribs
5) closed chest injuries
6) ruptured spleen, liver, and/or kidneys
7) fractures of any or all of the extremities
8) fractured pelvis

Needless to say, if the victim survives the fall, with even one of the above, he's in trouble; usually the survivor will have many of the above in combination. So the survivor needs to be handled GENTLY. And that does not mean pulling your boat up along side of the victim in the water, grabbing whatever piece of anatomy or clothing you can get hold of, and dragging the victim up the side of your boat, over the rail and plopping him onto the deck. I can't think of a worse way to treat a patient with severe injuries than that. Any of the injuries mentioned above would be made worse by such handling; in fact, the victim might well die because of such rough handling.

There is a better way to recover seriously injured people from the water. Coast Guard EMTs are taught the technique, and its described in

the Addendum to the SAR Manual (COMDTINST M16130.2 section 11). The technique is called the Stokes Litter Recovery and it was specifically designed for such emergencies. A properly rigged Stokes litter is lowered into the water, with lines tied to the head and foot end of the litter. One crewman aboard the boat tends the lines, while another crewman, properly fitted with a swimmer's harness and PFD or wet suit, enters the water to assist the victim.

Some stations have used the Stokes litter recovery method without using a rescue swimmer, but it's harder and slower that way. In addition, a bridge jumper may be floating face down or have other respiratory problems which require a rescue swimmer's assistance. The swimmer gently maneuvers the patient into the litter and secures the chest pad and straps. The Stokes litter thus acts as a whole-body splint, minimizing the potential for injury when the patient is brought aboard. The Stokes litter and patient are then pulled aboard head first. This is usually a two-man operation, since the litter and wet patient will often weigh over 200 pounds. If the boat has a four-man crew, the two-man lift should pose no problem. If the boat has only a three-man crew, the rescue swimmer climbs back aboard first and assists with the recovery. The boat coxswain should not leave the helm to assist. Once aboard the boat, a thorough examination of the patient can be made, and the injuries can be treated accordingly. Remember the possibility of neck fracture. If the patient needs CPR, use the jaw thrust method instead of the head tilt to open the airway. All bridge jumper survivors should probably have a cervical collar applied, they should not be taken out of the litter until delivery to the hospital or ambulance, and then with great care.

If you station has a Coast Guard trained EMT aboard, he or she can demonstrate the technique. As mentioned previously, it's also described in the SAR Manual. I strongly recommend that boat crewmen become familiar with this potentially life saving maneuver, even if you don't have bridge jumpers in your area. The technique should be used anytime you rescue an injured person in the water.

AN IMPORTANT EPIRB FACT

A little known fact about EPIRBs came to light during discussions with a prominent manufacturer of these devices. An EPIRB which is designed to meet FCC specifications must be capable of 48 hours continuous transmission at - 4°F. Since transmission time increases with temperature, such a beacon may transmit as long as 7 days at temperatures of 70°F and above. At temperatures in between, values between 48 hours and 7 days can be expected.

FATIGUE LIMITS FOR SEARCH AND RESCUE BOAT CREWS

by

CAPT. Robert B. Workman, USCG

Editors Note: The author, Captain WORKMAN was head of the SAR Evaluation Group which has just completed a two year study of the Coast Guard SAR Program. His views, as expressed here, have been formed by this work. At the present time, the study recommendations have not yet been approved. Accordingly this article does not reflect the official views of the Coast Guard at this time. However, the information can be of general value to those who operationally manage SAR boats and crews.

An important factor most often overlooked or ignored when establishing the crew allowance for stations with SAR boat crews is fatigue brought on during operational performance. Until recently, tactics employing the use of boat crews by operational commanders basically ignored diminished operational capability brought on by fatigue, but acknowledged that at some point fatigue would impair safety. SAR statistics show frequent voyages in excess of ten hours, some are in excess of 15 or even 20 hours. Although operational commanders attempt to "manage the fatigue problem," inadequate staffing of Coast Guard boat units hampers the proper solution --- establish boat crew fatigue standards and staff for them.

Operational results, or various operational mission tasks including navigation and seamanship, have a common parameter that is involved in mission success --- visual vigilance. Visual vigilance is a medical parameter that can be used to measure fatigue of a crewman. Visual vigilance involves not only the alertness of the eye but the transmission of information from the eye to the brain, the alertness for reporting or action taking. Visual vigilence can be measured by establishing a controlled operational situation where variables are controlled or measured as in a scientific experiment. A recent Coast Guard R&D effort to improve sweep width tables for search planning in the National SAR Manual provided a rare opportunity. Numerous boat search sorties, among others, were executed in visual detection experiments conducted in a Block Island Sound controlled search area. Search targets were accurately positioned daily using a microwave ranging system. The number and positions of the targets relative to planned search tracks were designed to provide about six detection opportunities per hour. Searches were conducted in the same manner as actual SAR missions. Visibility, waveheight, wind speed and cloud cover were recorded at several different times each day and for each target sighting the following data was collected:

- Time target was sighted
- Approximate range and relative bearing to target
- Relative bearing of sun
- Searcher course, speed and altitude
- Target color
- Position of lookout making sighting

Target sighting opportunities that should have resulted in a reported sighting were recorded as were underway times for search boats.

Based on raw data obtained from the R&D experiment, targets detected were divided by opportunities to detect a target thereby identifying probability of detection for blocks of time spent searching. The results are shown in figures 1 and 2.

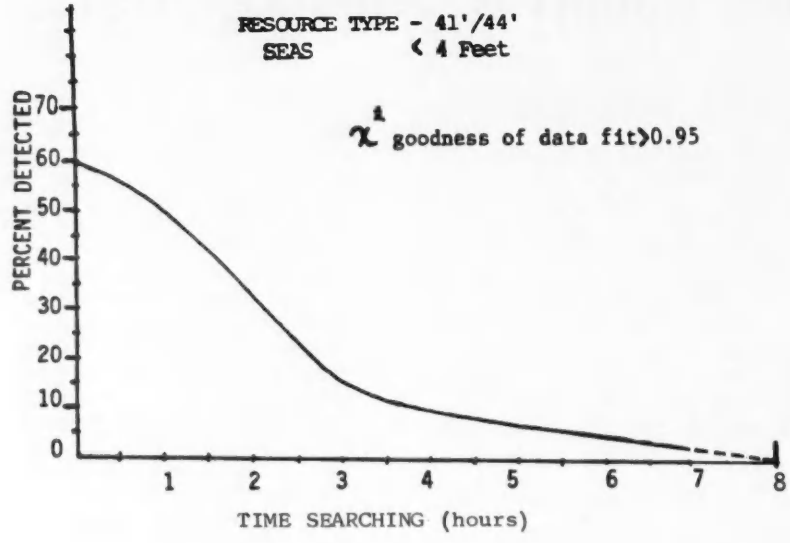

Figure 1

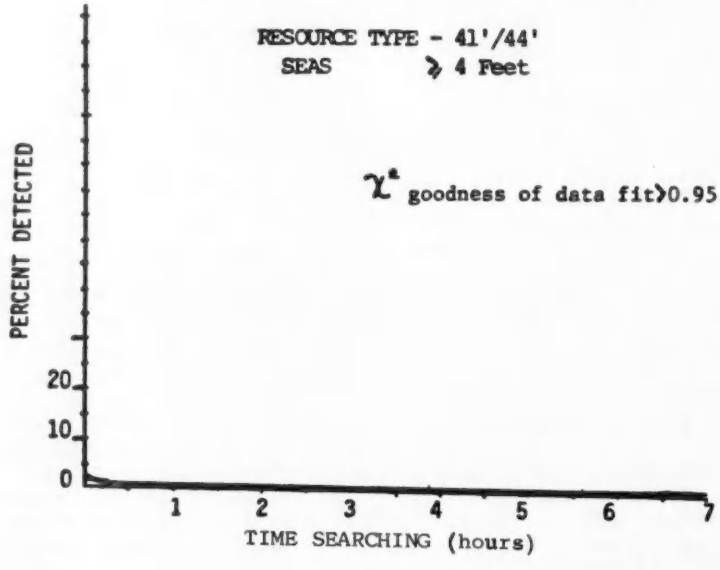

Figure 2

The obvious conclusion drawn from these figures is that greater than eight hour sorties by small boats produce an unacceptable operational performance, or results, due to fatigue. Furthermore, in less than four foot seas, the boat crew would be most alert within the first four hours of a voyage and it is reasonable to expect that optimum crew performance will occur during this same period. Additionally, results of searches in seas greater than 4 feet have shown that boats are not generally productive and result in a drain on resources. Under these conditions, an alternate resource is preferred, either an aircraft or a larger vessel.

Although not a scientifically controlled experiment and less accurate, the SAR data base shows the same relationship based on actual operational performance. As in the controlled experiment, search success was measured within two operating environments, seas = 0 to less than 4 feet and seas = 4 feet or greater. To eliminate any possibility of data distortion arising from the question of whether or not the search objective was capable of being found (sunken vessel vs floating vessel or debris, etc.) only successful search data was used. The search objective was potentially findable every time. So as to eliminate any possibility of data distortion arising from mixing multiple search units vs single search unit cases, single search unit case data was utilized. The number of successful searches reported in the SAR Data Base for FY 77, 78 and 79 were each plotted against time searched. Two hours were allowed for transit time to and from the search scene, so that individual unit sortie time is 2 hours + search time. Results of the plots' functional relationship is shown in figures 3 & 4.

SUCCESSFUL VISUAL BOAT SEARCHES VS HOURS ON SORTIE
SEAS LESS THAN 4 FEET

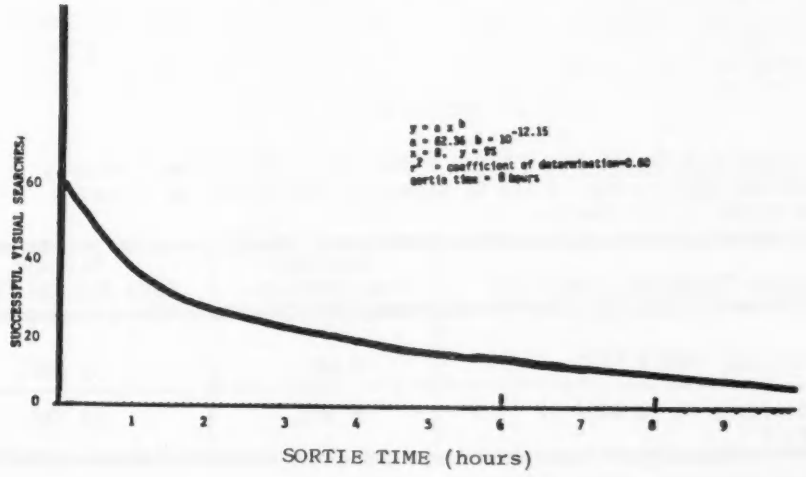

Figure 3

SUCCESSFUL VISUAL BOAT SEARCHES VS HOURS ON SORTIE
SEAS GREATER THAN 4 FEET

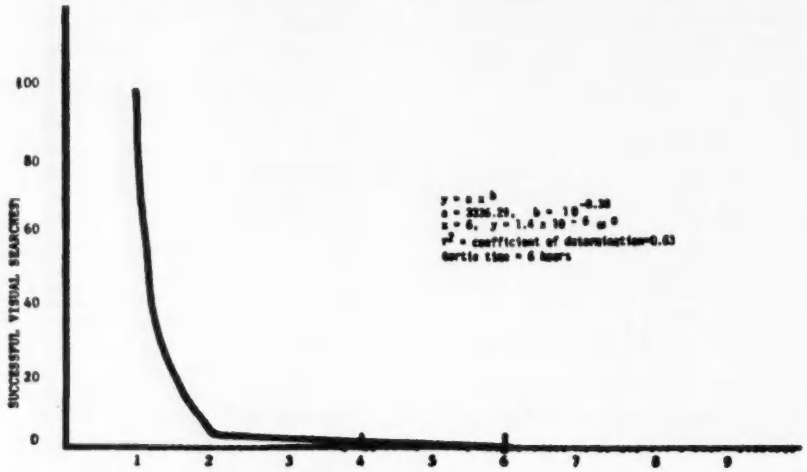

Figure 4

Sufficient statistical evidence exists identifying the pervasiveness of fatigue on operational capability and safety to place reasonable limitations on boat crews. Uniform boatcrew utilization Standards are necessary to help reduce fatigue as a factor in the degradation of operational performance and to help reduce fatigue as a factor contributing to boat accidents/ incidents/. Standards should not be intended to restrict operational commanders unduly when urgent operations are required. Day-to-day conformance, with acknowledged occasional exception to the rule, is necessary if chronic and acute fatigue is to be reduced.

Based on statistical evidence the below standards would be both reasonable and feasible.

BOATCREW SCHEDULING STANDARDS. Within any consecutive 24 hours, boatcrew members should not be scheduled (assigned) to exceed the below hourly limits:

MISSION OPERATING CONDITIONS	MAXIMUM TIME UNDERWAY	MAXIMUM CREW MISSION TIME
SEAS LESS THAN 4 FEET	8 HRS.	12 HRS.
SEAS EQUAL TO OR GREATER THAN 4 FEET	6 HRS.	12 HRS.

A new 24 hour period will begin anytime a crewmember has completed 10 hours of rest, regardless of duty status. Deadhead time may not be included as part of rest time.

If boatcrews actually exceed scheduling standards, the below rest hours off duty should apply:

DUTY OR BOAT MAINTENANCE DUTY:

TIME UNDERWAY	CREW MISSION TIME	HOURS OFF DUTY
6.0 - 6.9	10.0 - 10.9	12
7.0 - 7.9	11.0 - 11.9	18
OVER 8.0	OVER 12.0	24

In summary, the motivation for introduction of maximum utilization factors for boat crews (fatigue constraints) involves three basic areas:

Operational Product - Will a boat crew obtain the expected results envisioned for an operation? There is a factor of time and environmental condition that will reduce a boat crew's potential operational product below an acceptable limit.

Safety - There is the factor of time and environmental condition that will reduce a boat crewman's motor reflex reaction time, judgement making reaction time, stimuli recognition/ reaction time, etc. to a level such that the safety of the boat, crewman or others is potentially jeopardized.

Staffing - Proper staffing of units with probablilistic computed numbers of trained boat crews will improve both performance and safety of operations. Probablilistic queuing computation, in this case, includes the limitations of humans as well as limitations of the boats crewed by them.

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